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Globalization and interdependence: science and technology for development

Science and technology for development

Report of the Secretary-General

Summary

The present report, submitted in response to General Assembly resolution 64/212, provides information on the work of the Commission on Science and Technology for Development in areas such as agriculture, rural development, information and communications technologies and environmental management. It also provides information on the activities carried out by the United Nations Conference on Trade and Development (UNCTAD) and other relevant organizations to assist developing countries in their efforts to integrate science, technology and innovation policies into their respective national development plans and strategies.

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I. Introduction

1. In resolution 64/212, the General Assembly reaffirmed its commitment to strengthen and enhance existing mechanisms and to support initiatives for research and development, including through voluntary partnerships between the public and private sectors, to address the special needs of developing countries in the areas of health, agriculture, conservation, sustainable use of natural resources and environmental management, energy, forestry and the impact of climate change. In this context, the Assembly also reaffirmed its commitment to support initiatives for a number of science and technology-related issues, including the transfer and diffusion of technologies; the promotion and development of national strategies for human resources and science and technology; the development of renewable sources of energy; the implementation of policies to attract both public and private investment, domestic and foreign, that enhances knowledge, transfers technology on mutually agreed terms and raises productivity; and the harnessing of new agricultural technologies with a view to increasing agricultural productivity through environmentally sustainable means.

2. In the same resolution, the General Assembly requested the Commission on Science and Technology for Development to continue to assist the Economic and Social Council in the system-wide follow-up to the outcomes of the World Summit on the Information Society and to address the special needs of developing countries in areas such as agriculture, rural development, information and communications technologies and environmental management. The Assembly encouraged UNCTAD, in collaboration with relevant partners, to continue to undertake science, technology and innovation policy reviews, with a view to assisting developing countries and countries with economies in transition in identifying the measures needed to integrate science, technology and innovation policies into their national development strategies.

3. The present report has been prepared in response to paragraph 10 of the resolution, in which the Assembly requested the Secretary-General to submit to it at its sixty-sixth session a report on the implementation of the resolution and recommendations for future follow-up, including lessons learned in integrating science, technology and innovation policies into national development strategies.

II. Work of the Commission on Science and Technology for Development in areas such as agriculture, rural development, information and communications technologies and environmental management

4. The Commission on Science and Technology for Development reasserted its unique role as an intergovernmental global forum for the examination of science and technology questions, the improvement of understanding of science and technology policies for development, and the formulation of recommendations and guidelines on science and technology matters within the United Nations system. In addition, the Commission continued to fulfil its mandate of assisting the Economic and Social

Council in the follow-up to the World Summit on the Information Society[1] and the commitment set out in paragraph 60 of the 2005 World Summit Outcome (see General Assembly resolution 60/1).

5. The secretariat of the Commission on Science and Technology for Development has, through the sessions of the Commission and the projects undertaken by UNCTAD, undertaken a number of initiatives which address the special needs of developing countries in areas such as agriculture, rural development, information and communications technologies and environmental management.

A. Thirteenth session of the Commission on Science and Technology for Development

6. At its thirteenth session, held in Geneva from 17 to 21 May 2010, the Commission carried out a five-year review of the progress made in the implementation of and follow-up to the outcomes of the World Summit on the Information Society at the regional and international levels, and considered two priority themes, "Improvements and innovations in existing financial mechanisms" and "New and emerging technologies".

7. Participants noted that while rapid progress had been achieved in improving access to information and communications technologies at the global level, the significant gaps remaining within economies and societies affected the demand for and the ability to use such technologies. Participants identified some of the main impediments faced by developing countries in accessing the new technologies, including insufficient resources, infrastructure, education, capacity, investment and connectivity, as well as technology ownership, standards and flows. They called upon all stakeholders to provide adequate resources and to support efforts aimed at capacity-building and the transfer of technology to developing countries, particularly the least developed countries.

8. Participants expressed their concern at the widening gap in broadband connectivity, which further marginalized the poor, rural communities and other disadvantaged groups, such as women, the disabled and the elderly. They commended initiatives aimed at achieving rapid broadband deployment and underscored the need to prioritize innovative approaches within national and regional development strategies. Also reiterated was the importance of indicators for information and communications technology as a monitoring and evaluation tool for measuring the digital divide among countries and within societies and for informing decision makers in the formulation of policies and strategies for social, cultural and economic development. Participants highlighted the importance of standardization and harmonization of reliable and regularly updated indicators which would capture the performance, efficiency, affordability and quality of goods and services.

9. In addressing the priority theme on new and emerging technologies, the discussion focused on renewable energy technologies. It was recognized that such technologies must be part of the mix if energy security, climate change mitigation and increased energy access were to be achieved. It was also recognized that

[1] See, for example, A/66/64, and *Implementing WSIS Outcomes: Experience to Date and Prospects for the Future* (UNCTAD/DTL/STICT/2011/3), Geneva, May 2011.

technology transfer was an important facet in the deployment of renewable energy technologies in developing countries. The transfer of the hardware must be complemented by the transfer of the skills and expertise to operate it and to adapt and modify it to local conditions. Where possible, technology options that maximize the use of existing local capabilities should be chosen. In addition, efforts to expand existing — and build new — local innovative capabilities by means of training centres and knowledge networks were viewed as important for the effective and sustainable deployment of renewable energy technologies. Participants noted that investors, project developers and consumers were disinclined to support renewable energy technologies because of the costs involved. Government policy could do much to rectify this. In particular, mechanisms such as subsidy schemes, feed-in tariffs and the reduction of import duties could help to bring such technologies to the market. Importantly, the market must be nurtured to ensure its sustainability once financial mechanisms had been phased out. Given that there was no one-policy-fits-all approach, it was considered that a systemic review of a variety of approaches to the transfer of low-carbon technologies and the deployment of renewable energy technologies would be valuable.

10. Participants called upon Governments to provide an enabling environment which would encourage the adoption of private and public sector initiatives in new and emerging technologies and in the generation and dissemination of renewable energy technologies. They recommended for consideration by national governments a number of policy measures to promote local innovative capabilities, namely: provision of support to universities and public research centres dedicated to renewable energy technologies; provision of support to community participation in decision-making; ensuring that communities have the requisite capabilities to manage the low-carbon technologies deployed in their area; provision of incentives for research, development and deployment; and establishment of business parks and innovation clusters. Governments were urged to adopt regulatory and procurement policies to foster competition and private sector development and to attract domestic and foreign direct investment. They were invited to consider the use of appropriate policy instruments, such as subsidy schemes, feed-in tariffs, tax credits, financial guarantees and the reduction of import duties to support technology deployment in niche markets and encourage joint ventures and foreign direct investment in the manufacture and use of renewable energy technologies. Participants also called upon the Commission on Science and Technology for Development to continue to serve as a platform for sharing examples of good practice and promoting North-South and South-South partnerships, especially in regard to new and emerging technologies and the transfer and deployment of renewable energy technologies.

B. Fourteenth session of the Commission on Science and Technology for Development

11. At its fourteenth session, held in Geneva from 23 to 27 May 2011, the Commission considered two priority themes, "Measuring the impact of information and communications technology for development" and "Technologies to address

challenges in areas such as agriculture and water".[2] In addition, two ministerial round tables were held, one to review the progress made in the implementation of the Summit outcomes and another to consider the harnessing of science and technology for development. During the session, a panel meeting was convened to discuss e-science, e-engineering and e-education.

12. Participants highlighted the significant progress achieved in providing access to information and communications technologies, most notably mobile telephony and the Internet. It was, however, noted that the gap between developed and developing countries in regard to broadband access had widened. User-generated content has increased in the past few years but content was not necessarily available in all languages and for all groups in all parts of the world. The digital divide had therefore taken on new dimensions as regards the quality of access, information and skills that users could obtain and the value to be derived. Participants expressed concern that information and communications technologies and their applications were still unaffordable for most people, particularly those living in rural areas.

13. In reviewing the progress made in the implementation of the Summit outcomes since 2005, participants observed that the important role of the private sector in driving the development of information and communications technologies and in building the related infrastructure had been supported by an enabling environment, created by Governments, which encompassed independent regulators; respect for the rule of law; protection and enforcement of intellectual property rights; legal, policy, and regulatory frameworks that encouraged competition; independent courts; and policies that promoted entrepreneurship. Participants highlighted a number of new and emerging areas which deserved policy attention, namely, the potential role of information and communications technologies in combating climate change; social networking; privacy protection; and cyber exploitation and abuse.

14. In addressing the priority theme "Measuring the impact of information and communications technology for development", participants called on the Partnership on Measuring Information and Communication Technologies for Development to further its work on measuring the impact of such technologies, particularly in developing countries, by establishing practical guidelines, methodologies and indicators. Participants encouraged national governments to collect relevant data, share country case studies and cooperate in regard to capacity-building. Participants encouraged the relevant United Nations entities and other agencies to promote assessments of the impact of information and communications technologies on poverty and in key sectors in order to identify the knowledge and skills needed to boost their impact. In addition, participants called upon international development partners to financially support capacity-building efforts.

15. In addressing the priority theme "Technologies to address challenges in areas such as agriculture and water", the discussion focused on the challenges faced by smallholder farmers in developing countries. It was noted that nearly 1 billion people were undernourished and that their number might further increase as a result of the global financial crisis, sustained high levels of unemployment, increased food price volatility and food shortages, and the predicted further widespread droughts and floods. Fortunately, a range of existing science and technology applications and

[2] See E/CN.16/2011/2, E/CN.16/2011/3 and *Water for Food: Innovative Water Management Technologies for Food and Poverty Alleviation*, UNCTAD Current Studies on Science Technology and Innovation, No. 4 (UNCTAD/DTL/STICT/2011/2).

farming practices at all stages of the agricultural process can significantly increase productivity. There was recognition that a shift was needed from conventional mono-crops to sustainable regenerative systems. It was also recognized that smallholders should be at the centre of policy and technology decisions. Smallholder farming was generally labour-intensive, did not rely heavily on external inputs and was more dependent on the local environment; the introduction of modern science and technology to smallholder farming should take these characteristics into account and be based on farmer knowledge networks, better infrastructure, and a system approach which involved crop rotation and integrated crop and feedstock production. Among smallholder farmers, greater emphasis should be placed on women who play a key role in agriculture but often face challenges in moving beyond subsistence farming as they lack access to key resources. Participants called upon the Commission to facilitate the exchange, dissemination and diffusion of examples of best practice in the area of agricultural science, technology and innovation and in regard to cooperation between countries.

16. At the same session, the Commission took note of the outcome of the Fourth United Nations Conference on the Least Developed Countries, held in Istanbul from 9 to 13 May 2011, and extended its appreciation to the Turkish Government for its initiative in setting up an international science, technology and innovation centre dedicated to the least developed countries, which would serve also as a technology bank that would help them to utilize critical technologies. The Commission, UNCTAD and the Scientific and Technological Research Council of Turkey have since engaged in consultations on ways and means to implement the outcome of the Conference.

C. Five-year review of the implementation of the outcomes of the World Summit on the Information Society

17. In November 2010, the Chair of the Commission on Science and Technology for Development launched an open, multi-stakeholder consultation on the progress made in the implementation of the outcomes of the World Summit on the Information Society. A questionnaire was sent to all Member States, regional and international entities of the United Nations system, associations and agencies in the information and communications technology sector, and private sector and civil society actors. The purpose of the review was to identify the areas which had registered the most progress, and those in which obstacles and constraints had been encountered and innovative measures to overcome them. In line with Economic and Social Council resolution 2006/46, the review also considered how changes in the information and communications technology landscape might call for increased or reduced attention to certain areas.

18. The outcome of the consultation formed the basis of the report entitled *Implementing WSIS Outcomes: Experience to Date and Prospects for the Future*,[3] which was released during the fourteenth session of the Commission. The report observes that substantial progress has been made towards achieving the universal availability and use of basic telecommunications since 2005, and that the expansion of mobile telephony was particularly noteworthy. It notes that most of the progress achieved towards the 10 targets of the Summit was in ensuring that everyone has

[3] UNCTAD/DTL/STICT/2011/3; available from www.unctad.org/en/docs/dtlstict2011d3_en.pdf.

access to the information and communications technologies within their reach, and enabling access to such technologies in rural areas. Progress was also made in each of the action line thematic areas. However, while the digital divide in both voice telephony and basic Internet access had narrowed, there was increasing concern about the continuing, and perhaps even growing, divergence in the quality of access to communications, including the Internet, and the value derived from such access. A number of constraints had inhibited the achievement of the Summit outcomes, including the lack of affordable infrastructure and continuing weaknesses in investment and communications regulation. Users must be able to make use of communications services and to access relevant content in order to take full advantage of the potential of information and communications technologies. Policy approaches need to be rooted in a more holistic understanding of the changes taking place in society, the economy and the culture at the local, national and international levels. The Partnership on Measuring Information and Communications Technologies for Development has identified indicators which should improve our ability to measure progress prior to the comprehensive review to be undertaken in 2015. The report proposed undertaking potentially valuable inputs to the 2015 review, such as a comprehensive survey of the work of private sector and civil society organizations in the implementation of the World Summit outcomes, as well as a thorough analysis of wider social and economic developments in world society and the relationship between those developments and information and communications technologies.

III. Work of the United Nations Conference on Trade and Development in the area of science, technology and innovation

A. Research and capacity-building in science, technology and innovation for sustainable development

19. *The Technology and Innovation Report* is a new flagship series of studies issued by UNCTAD, drawing attention to the importance of technology and innovation for the economic development of countries. The series seeks to address in a comprehensive way issues in science, technology and innovation that are both topical and important for developing countries, with an emphasis on policy-relevant analysis and conclusions.

20. The first report in the series[4] looked at how the current trend towards declining agricultural productivity in African countries can be reversed by what are known as agricultural innovation systems. The report identified risks to smallholder farms in African agriculture as both a result of external influences (e.g., World Trade Organization discussions, international seed companies and the growing privatization of agricultural knowledge) and internal pressures, such as malnutrition, hunger and poverty. Arguing that stagnant agricultural productivity in Africa has become a major development challenge for Africa, the report called for the building of agricultural innovation systems that would reverse declining agricultural

[4] *Technology and Innovation Report 2010: Enhancing Food Security in Africa through Science, Technology and Innovation*, United Nations publication, Sales No. E.09.II.D.22 (UNCTAD/TIR/2009).

productivity through an enabling framework not only for the adoption of existing technologies but the development of new ones suited for Africa's needs. In this process, attention would be focused on the smallholders who represent the bulk of the continent's farmers.

21. The forthcoming second report in the series focuses on the greater use of renewable energies in developing countries, and seeks to join the ongoing international discourse on the need to promote the use of low-carbon technologies globally. The report analyses the important role of science, technology and innovation in the expanded application and wider acceptance of renewable energies, particularly in the context of developing countries.

22. The report argues that sustained economic growth of the kind that leads to a continued improvement in the living standards of all people through poverty reduction rests on energy access for all. Such a global agenda requires a focus on energy efficiency that would also promote energy flexibility for all countries through the provision of newer or more cost-effective energy solutions. It also requires that more serious consideration be given to newer energy sources which could complement conventional sources in the quest to promote energy access for all. At the same time, such solutions need to take on board the overwhelming environmental challenge that mankind faces today, which is to limit the damage that economic activity inflicts on the planet's environment. Joining with other United Nations agencies working in this area, the report submits that a mutually compatible response to the dual challenge of reducing energy poverty and promoting climate change-friendly solutions calls for a new energy paradigm. The new energy paradigm will have renewable energy technologies play a complementary role along with conventional energy sources with a view towards the eradication of energy poverty.

23. In 2010, UNCTAD launched a new series, Current Studies on Science, Technology and Innovation,[5] which seeks to examine salient topics related to science, technology and innovation for development. The first in the series[6] provides an overview of some of the issues surrounding the use of renewable energy technologies to increase access to modern energy services in rural areas. Drawing on examples from Argentina, China, Eritrea, Guatemala, the Lao People's Democratic Republic, Namibia and Nepal, the study concludes that the design and affordability of these technologies, the installation cost, lack of awareness, and lack of appropriate policy support from government represent some of the main barriers to their effective deployment. The challenge for Governments is to ensure that the deployment of renewable energy technologies is integrated into wider rural development strategies in order to meet local needs and priorities. National policies, for example, can support the provision of subsidies and the development and implementation of research projects, public awareness campaigns, programmes and regulations. The study underscores the need for technology transfer on the one hand, and the building of local capabilities on the other.

[5] Available from www.unctad.org/Templates/Page.asp?intItemID=5492&lang=1.

[6] *Renewable Energy Technologies for Rural Development*, UNCTAD Current Studies on Science, Technology and Innovation, No. 1 (UNCTAD/DTL/STICT/2009/4).

24. The fourth study in the series,[7] examines the challenges related to agricultural water management in the context of climate change, increased demand for food production and environmental sustainability, and reviews the potential role of technologies in regard to water productivity, resilience in agricultural water management and sustainable livelihoods. It reviews a host of appropriate technologies and associated management practices, including traditional practices (such as water harvesting and storage) and new and emerging ones (such as geographical information systems), and discusses key areas for future action to accelerate the diffusion and adoption of those technologies and practices.

25. In the latter part of 2011, UNCTAD will release a study on applying a gender lens to science, technology and innovation. The study notes that, although there is growing recognition that science, technology and innovation can have a significant impact on promoting development, the associated policies generally lack a gender perspective and therefore do not adequately address all development concerns. It argues that, given the role of women in the economy and society, taking into account the situations, needs and concerns of women as well as of men will enhance the efficiency of science, technology and innovation policies for development. The study highlights the need to integrate a gender perspective throughout the policymaking process, from diagnosis through policy design to implementation, monitoring and follow-up. It recommends that science, technology and innovation policies and programmes undergo a gender impact assessment to ensure that they deliver equality of opportunities to men and women. Prepared in collaboration with the Gender Advisory Board of the Commission on Science and Technology for Development, the study identifies three entry points for applying a gender lens in science, technology and innovation policy, namely:

(a) Science for women: developing science and technology which support women's development and livelihood activities;

(b) Women in science: promoting gender equality in science and technology education, careers and leadership;

(c) Encouraging and supporting the role of women in innovation systems at the national and grass-roots levels.

B. Expert meetings on enterprise development policies and capacity-building in science, technology and innovation

26. The second expert meeting on enterprise development policies and capacity-building in science, technology and innovation was convened by UNCTAD in Geneva, from 20 to 22 January 2010. The meeting focused on the design, monitoring, and assessment of entrepreneurship and science, technology and innovation policies that could support and drive economic development strategies. Participants stressed that science, technology and innovation was a major driver of knowledge-based economies and sustainable economic development and noted the value of developing coherent science, technology and innovation policies that are adapted to the realities and opportunities of developing countries. They encouraged

[7] *Water for Food: Innovative Water Management Technologies for Food and Poverty Alleviation*, UNCTAD Current Studies on Science Technology and Innovation, No. 4 (UNCTAD/DTL/STICT/2011/2).

UNCTAD to further develop its research and policy analysis on science, technology and innovation issues, to continue to serve as a forum for science, technology and innovation policy dialogue, and to continue to implement science, technology and innovation policy reviews in developing countries. Some of the key issues noted by experts regarding the use of science, technology and innovation indicators in the design and evaluation of evidence-based policies include:

(a) Science, technology and innovation indicators need to be relevant and be adapted to the specific context of developing countries which cannot rely on indicators directly taken from the experience of developed countries;

(b) The limited availability of internationally comparable science, technology and innovation indicators represents a problem for policymaking;

(c) Developing countries have limited capacities to analyse science, technology and innovation data and to formulate evidence-based policies;

(d) There is a need to promote the development of relevant science, technology and innovation for the purposes of policy design, implementation and evaluation. In that regard, the possibility of identifying a common list of science, technology and innovation indicators adapted to the realities of developing countries was discussed.

27. The third expert meeting on enterprise development policies and capacity-building in science, technology and innovation was convened by UNCTAD in Geneva, from 19 to 21 January 2011. Participants noted several common constraints related to educational and research institutions that affected the ability of developing countries to harness science, technology and innovation. One was the lack of national strategies on capacity-building, which led to weak educational infrastructure, a poor performance by educational systems in building science, technology and innovation capacity, and weak linkages among academia, research institutes and the private sector. Other constraints identified included: inadequate intellectual property policies and the absence of offices dedicated to technology transfer and of staff with the relevant skills and experience; a lack of entrepreneurial culture among researchers; a lack of understanding of the importance of science, technology and innovation for development and marginalization of the issue in national development agendas; and weaknesses in the technological capabilities of firms and in the infrastructure related to science, technology and innovation.

28. Participants underlined the need to develop strong innovative capabilities, in combination with strong scientific and technological absorptive capabilities. Science, technology and innovation policy should provide the incentives for educational and research institutions to develop agendas that match more closely the requirements of domestic enterprises and local communities. In that regard, there was a need to ensure that science, technology and innovation policy considered educational and research institutions as central elements of national innovation systems, within which strong collaborative linkages should be established between academia and enterprises.

29. Training scientists and engineers in key areas of interest with a view to the technological upgrading of developing countries should be a major focus of such collaboration. It was considered that the establishment and reinforcement of networks of centres of scientific and technological excellence willing to engage in such efforts could greatly contribute to increasing the outreach and effectiveness of

capacity-building in science, technology and innovation. UNCTAD was encouraged to continue its work in this field.

C. Expert meeting on green and renewable technologies as energy solutions for rural development

30. An expert meeting on green and renewable technologies as energy solutions for rural development was convened by UNCTAD in Geneva, from 9 to 11 February 2010. The aim of the meeting was on strategies to overcome challenges in using renewable energy technologies to catalyse rural development. Some 130 persons attended the meeting, representing over 53 countries and 31 intergovernmental and non-governmental organizations.

31. The meeting concluded that renewable energy technologies could play a significant role in national poverty reduction strategies, enhanced energy security and access to affordable energy, as well as climate change mitigation. It was considered that scaled-up deployment of renewable energy technologies in rural areas could, notably, enhance agricultural supply capacity (both in quantitative and qualitative terms), support the development of artisanal business, strengthen export competitiveness, and open new opportunities for South-South cooperation and increased trade and investment. Participants emphasized the need to integrate deployment of renewable energy technologies into strategies for rural development and poverty reduction. They highlighted the importance of technology transfer and building local capabilities. Participants called upon UNCTAD to, inter alia, carry out research on integrated approaches to renewable energy technologies as a tool for pro-poor development, facilitate the exchange between countries and communities of experiences and best practices, and promote South-South cooperation in the area of renewable energy technologies for rural development, including trade and technology transfer aspects.

D. Network of Centres of Excellence

32. The Commission on Science and Technology for Development continued to collaborate with UNCTAD on the Network of Centres of Excellence project.[8] The project is executed through a group of scientific and technological institutions in developing countries, which are selected for their competence, state-of-the-art facilities' and commitment to strengthen links and increase mobility within the scientific communities of developing countries.

33. The Network organizes training courses and workshops on science and technology applications for scientists and engineers from developing countries, in particular African countries. The courses enable the scientists and engineers to update their professional expertise in a modern scientific environment. They also strengthen professional linkages within the scientific community and facilitate the mobility of science and technology professionals.

34. The Network was launched in 2005, under a project funded by the Government of Italy. Since then, more than 120 scientists, engineers and academics from

[8] See www.unctad.org/noce.

25 African countries have benefited from the 11 training courses organized in China, Egypt, India, South Africa, Tunisia and the United Republic of Tanzania. Topics covered in the training activities are: biosafety and the detection of genetically modified organisms; molecular marker techniques and fingerprinting; advanced molecular biology; information technology in agriculture for Africa; bioinformatics; malaria-related research and training; animal biotechnology; advanced laboratory training in regard to infectious disease; molecular medicine; and cybersecurity.

35. In November 2010, within the framework of the Network and in collaboration with the National Agency for Computer Security of Tunisia, UNCTAD organized a training session on cybersecurity in Hammamet, Tunisia. Several of the participants are members of the new national computer emergency teams currently being established in several African countries. Twelve participants from 11 African countries, including 8 least developed countries, benefited from the course.

E. Science, technology and innovation policy reviews

36. In its resolution 2009/8, the Economic and Social Council, in extending its appreciation to UNCTAD for undertaking science, technology and innovation policy reviews, encouraged it to continue to provide its expertise and analytical skills in that regard. In its resolution 2010/3, the Council encouraged UNCTAD to increase significantly its efforts to conduct such reviews in response to a high demand from member countries, in close collaboration with other relevant international organizations, particularly the United Nations Educational, Scientific and Cultural Organization (UNESCO), and with the Commission on Science and Technology for Development, the regional commissions and other appropriate stakeholders, including the World Bank and other international and regional development banks, with a view to assisting developing countries in strengthening their science, technology and innovation systems.

37. The main focus of UNCTAD in its technical cooperation work in this area has been the implementation of science, technology and innovation policy reviews at the request of developing countries. The main objective of such reviews is to help Governments to ensure that their science, technology and innovation policies and programmes support national development agendas by enabling the emergence and development of national innovation systems. Such systems help national productive sectors become more competitive in a knowledge-based, global economy and therefore stimulate economic growth and help meet major development challenges. Policy reviews have been completed for Angola, Colombia, Ethiopia, Ghana, the Islamic Republic of Iran, Jamaica, Lesotho, Mauritania and Peru. UNCTAD undertook the policy review of Angola in collaboration with the United Nations Development Programme (UNDP); of Ghana with the World Bank; of Lesotho with UNDP and UNESCO; of Mauritania with UNESCO; and of Peru with the Economic Commission for Latin America and the Caribbean (ECLAC). The policy reviews of El Salvador and the Dominican Republic, which will be finalized in 2011, have also been undertaken in collaboration with ECLAC.

38. Lessons drawn from the African series of science, technology and innovation policy reviews have been applied to the more recent Latin American and the Caribbean series. Among these lessons are the critical role of the national counterpart and the importance of involving stakeholders in the process. The impact

on policy is maximized when the review can be timed and orchestrated in such a way that it feeds into locally driven processes. Finally, political will and leadership at the highest levels are crucial for success, especially where cohesive inter-ministerial cooperation is difficult to achieve.

39. With a view to consolidating academic thinking and other viewpoints into the science, technology and innovation policy review programme, UNCTAD organized two expert meetings in 2010. The discussions at those meetings concerned conceptual and methodological issues relevant to the assessment of science, technology and innovation policies in developing countries. The outcome of the two meetings will be reflected in a set of guidelines for the implementation of the policy reviews, which will be released in 2011. Such guidelines are intended to enhance the effectiveness and consistency of the outcome of the policy reviews and should therefore facilitate the development of a repository of best practice in regard to science, technology and innovation policy in developing countries. The guidelines should give interested developing countries more precise information about the purposes of the process and the modalities for its implementation; this is expected to improve national ownership of the science, technology and innovation policy review and assist in the implementation of the recommendations arising from such reviews. The guidelines will also facilitate discussions with interested donor countries and cooperation with other international agencies active in the field of science, technology and innovation.

40. The first expert meeting addressed the issue of science, technology and innovation indicators and the lack of up-to-date and relevant data in many client countries. Other related problems examined at the meeting included the issue of availability versus relevance, international comparability, and the importance of indicators in policy formulation. The challenge has been to design science, technology and innovation surveys that will lead to policies and measures that would in turn underpin innovation, particularly in countries for which science, technology and innovation is a relatively new concept. Indicators could, for example, be broadened to take impact into account and to capture innovation in the informal sector as well as in non-technology sectors. More specifically, human resource indicators could be given more emphasis. Another issue discussed was how to assess linkages among actors in national systems of innovation, particularly those between the private sector and government in the area of research and development.

41. The second expert meeting focused on the conceptual framework, the thematic scope and content of and the production process for the policy reviews. It was generally agreed that national systems of innovation, including sectoral innovation systems analysis, provided a useful framework for the reviews. The UNCTAD reviews generally included an analysis of sectors critical in national development objectives and priorities. Given the varying degrees of development and the wide variance in national priorities and conditions, it was considered that there could be no one-size-fits-all template for the policy reviews. However, a number of issues that needed to be covered were identified, including education, linkages between knowledge producers and users, intellectual property regimes, industrial policies and practices in relation to the transfer of technology.

42. The approach of the science, technology and innovation policy review programme is based on recognition of the central role of innovation in the process of economic development and of its essentially systemic nature. In this context,

technological innovation is understood as a broad notion which includes not only the introduction by firms of products, marketing methods or productive processes that are not only new to the world, but new also to the market or the firm. Innovation can thus take place not only by pushing back the frontiers of knowledge, but also (and this is most frequently the case in developing countries) when firms learn to implement and use technologies that are already available elsewhere. For developing countries, technology acquisition, imitation and adaptation are key innovative processes which can be as important as research and development.

43. The systems approach to innovation provides the basic conceptual framework for the production of science, technology and innovation policy reviews. The concept of the national system of innovation cuts across many institutional boundaries and involves a variety of links within and among many actors. The system is therefore necessarily complex and difficult to characterize by assessing its conformity with any particular model. This is all the more so in the case of developing countries in which the elements that integrate the ideal description of a national system of innovation and are found in the literature based on the experience of more advanced countries are either immature or non-existent. Therefore some adaptation to the standard national system of innovation framework is needed when it is applied in the context of a science, technology and innovation policy review.

44. For countries at an early stage of development, generating the ability to access, use and diffuse foreign technologies is more important than putting in place a fully fledged national system of innovation. The needs of emerging innovation systems for absorption and adaptation are not the same as those needed at the frontier of innovation. Accordingly, the emphasis in the analysis of the policy review report is placed on the development of innovation, as opposed to merely strengthening research and development or particular technical capabilities. The discussion in the report also needs to avoid unnecessary technical or academic analysis or abstract language and instead concentrate on identifying the key policy issues and generating practical policy recommendations.

45. A central concern in the context of most developing countries is how national systems of innovation enable the adoption, adaptation and diffusion of existing technologies, in particular through the transfer of technology at the international level, and the development of new technologies and their application. The national system of innovation framework should help policymakers to understand how policy that addresses systemic failures (coordination and networking problems, infrastructural deficiencies, rules and regulations, incentives and disincentives) and the capabilities of the various players can enhance technology absorption. The creation of absorptive capacity at the level of the firms, but also that of the national innovation system as a whole, is critical if the economy is to benefit from any increased exposure to the international knowledge and technology flows that may be gained through trade, investment or other mechanisms. Such absorptive capacity is defined by the availability of a wide range of skills and expertise and of material and non-material infrastructure. The aim is to develop capabilities to not only use and maintain more advanced equipment and techniques but also to dynamically adapt them to new processes or specific needs.

46. Many other aspects of science, technology and innovation policymaking take on a different importance in a development context and are accordingly reflected in the approach adopted for the policy reviews. These include, for example, the

optimization of trade and investment links with foreign sources of technology and the relationship between these links and the generation of endogenous technological capacities; the much greater importance of accelerating innovation in agriculture; a different balance with regard to the incentives and disincentives to innovation provided by the intellectual property regime; the importance of understanding and addressing innovation processes in the informal sector; and the need to consider the social consequences of rapid structural change induced by technological catch-up and innovation.

47. A key conclusion is that the success of a science, technology and innovation policy review depends critically on the availability and involvement of a strong, credible, high-level counterpart in the process. The involvement of national academic centres in carrying out the review should be solicited. Members of legislative bodies could also be invited to take part in national workshops at the beginning and/or at the end of the review.